Science vs. Ideology: The Role of Public Health in Bridging the Gap

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ABSTRACT
Science and ideology have been in conflict throughout history. This paper highlights some contemporary public and environmental health debates that have been influenced by a science vs. ideology perspective. We examine the role of public health professionals in bridging the gap between science and ideology using several examples where this conflict exists such as in the issues of global warming, cigarette smoking and the use of immunizations.
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Introduction

Our world – planet earth, is round. The Greeks postulated a round earth between the fifth and fourth centuries BC, and in 150 AD, Ptolemy, a Greek geographer, mathematician, and astronomer, compiled maps and other geographical evidence based on a curved globe. However, intellectual pursuit unfortunately went out of vogue in Europe between 400 and 1200 AD, and the world temporarily put round-earth theories to rest (Gulf of Maine Aquarium, Navigation and Mapping, 2009). Christopher Columbus' journey to the Americas in 1492 placed "civilization" squarely back on track. Since that time, the theory of the earth as a sphere has been disputed rarely. In fact, it is almost without exception no longer considered theory, but rather, scientific fact. However, *almost without exception* is the operative phrase. Organizations, such as the Flat Earth Society consist of a handful of members who are holding fast to the concept of the earth as a flat multi-layered disc, a short cylinder (Day, 1993). This society's faith in the truth of their position is based largely on literal interpretation of passages of scripture from the Christian Bible. The round earth vs. flat earth debate was one of the earliest examples of scientific discovery opposing religious or other ideology.

Whereas some scoff at the idea of such issues still being debated, the fact remains that science and ideology have been on opposite sides of such arguments throughout history. This paper highlights some contemporary public and environmental health debates that have been influenced by a *science vs. ideology* perspective. In addition, we will examine the role of public health professionals in bridging the gap between science and ideology.

Science and Ideology

Ideologies are beliefs that are based on assumptions or ideas. Unlike science, which tests hypotheses that result in evidence about the world around us, ideologies are rooted in a variety of contexts and entail social, political, religious and economic worldviews. Science applies specific, transparent methods to the investigation of hypotheses and to pursue "truth." Scientific methods are widely accepted and replicable.

Though ideologies are not rooted in the same investigative vigor, they should not be seen as fleeting or contrived. Ideologies are derived from centuries of personal and communal investment in social, familial, and religious values. We do not come by our ideologies lightly or artificially, and do not approach them superficially. Because ideologies are well established, they often win out over science, even in the face of hard evidence on an issue. Ideology can hold sway over political decision-making, funding, and the establishment of policy. It has never been enough simply to state: "But the data show…" Science in all arenas must acknowledge the presence and influence of ideological perspectives, and public health professionals must determine their personal and professional roles in navigating this ongoing conflict.

Whereas both science and ideology influence the practice of public and environmental health, neither is the sole criterion for health and environmental policy setting; both are essential components in developing, implementing, and evaluating public and environmental health and policy.

Public Health

Public health practices are rooted in concerted efforts to improve the health of communities. They rely on a combination of scientific methods and social approaches to health and disease prevention, and not on one specific body of knowledge. Such community or population-focused strategies for health include control of epidemics, measures to provide safe water and food supplies, the reduction of preventable diseases, improvements in maternal and child health and infant mortality rates,

and the general surveillance of health problems. The practice of public health is expanding in the face of newly defined issues, including global climate change, community violence, substance abuse, increasing rates of sexually transmitted infection (STI), natural disasters, and bioterrorism. The operative components of this description of public health are that these efforts are *organized* and *directed to communities* rather than to individuals. Public health differs from clinical medicine because it emphasizes a focus on the community rather than the individual: both the investigation of disease and the development of interventions focus on the multiple social and environmental determinants of disease. These characteristics make the *ideology vs. science* debate all the more important to our understanding of public health issues. Though one individual holding fast to a personal ideology in the face of a recommended medical treatment is challenging, it is more influential when a community, body of believers, or population does so. Historically, approaches to public and environmental health have been informed to a great extent by world views and ideologies, and as such, public health professionals struggle to decipher and disseminate health information from ideology and science. Researchers, public health professionals, politicians, and the lay public are in a tug of war between cultural ideology and science.

Global warming, cigarette smoking and the use of immunizations are important health and environmental issues that have posed considerable *science vs. ideology* challenges. This paper includes investigation of the *science vs. ideology* conflict for these issues as examples, and seeks to provide insight into the role of public health professionals in bridging the gap.

Current Debates

Issues of environmental health are at the forefront of the *ideology vs. science* conflict. Environmental problems that affect populations around the world include global climate change, the development of alternative fuels in the face of depletion of fossil fuels, and waste management. The ideologies involved in these complex face-offs are traditionally political and economic. Whereas there has been a great deal of research that demonstrates the health impact of these environmental problems, large factions of our global community oppose solutions that potentially compromise the pursuit of political and economic power.

Global Climate Change

The warming of the earth's climate system is a problem that threatens the entire world and poses major concerns for the scientific, ecological, and environmental health communities. The Intergovernmental Panel on Climate Change (IPPC) has demonstrated both the existence of climate variability and widespread global warming (Odingo, 2009). Studies by the IPPC have concluded that "observational evidence from all continents and most oceans shows that many natural systems are being affected by regional climate changes" (p.68). Further, "these changes are expected to trigger erratic increases in amounts and intensity of precipitation… and extreme events such as droughts, floods, heat waves, high winds, cyclones and ice melts" (p.68). The changes also will impact human health conditions around the globe, including changes in the production and nutritional adequacy of food sources, rates of infectious disease, concentrations of airborne pollutants and allergens, and general increases in morbidity and mortality (Odingo, 2009). Despite growing awareness of these health risks, strategies toward reversing climate change are not adopted readily. The public health sector has been concerned traditionally with surveillance and response to conditions when they occur, though with increasing awareness of the need for prevention and preparation (Ebi, Helmer, & Vainio, 2008).

The primary source of global climate change comes from greenhouse gases, and the primary impetus for human change would necessarily then come from industry and lifestyle. Because this is potentially a costly endeavor, more attention has been paid to arguments against the notion of global warming and advancing confusion among the lay public about the issues. Unfortunately for environmental advocates, these tactics have been successful. Coalitions funded by large for-profit companies such as the National Association of Manufacturers and the American Petroleum Institute have been quoted as trying to influence the public not to disprove global warming, but to cause confusion (Revkin, 2009). Its focus has been to show that scientists differ on the data related to research on global climate change. Although the coalition disbanded in 2002, one company, the Association of Automobile Manufacturers, went as far as to pursue legal action against the state of California in 2007 when the state tried to limit greenhouse gas emissions (Revkin, 2009).

Many attempts to encourage communities to reduce their output of carbon dioxide have come from documentaries such as *An Inconvenient Truth*, featuring former Vice President of the United State, Al Gore, and environmental organizations such as Green Peace and Friends of the Earth. In spite of many attempts to by environmentalists to encourage communities to "reduce, reuse and recycle," public health professionals are still faced with those who see global warming as a hoax or as a problem that is strictly nature and not induced by humans. The more culturally rooted debate, however, concerns the choice between saving the planet or having the freedom to leverage available services without restrictions and the ability to drive less "eco-friendly" vehicles due to personal preferences. The problem, then, lies in the hands of public health professionals to disseminate findings and recommendations from scientific research about climate change to the public in a way that captures their attention and provides all of the facts, while still understanding and respecting their current ideologies.

Lessons Learned from Other Scientific Debates

Cigarette Smoke

Another important public health issue that has caused much debate between scientists and the lay public is smoking and second hand smoke. Many of the ideologies behind these issues are deeply rooted and are often emotionally linked to personal values and beliefs. Thus, the challenge for public health professionals is to provide a link from science to ideology while staying true to the research and understanding the perspective of the public.

A plethora of scientific research has found that cigarette smoking and second hand smoke have been linked to several health issues such as lung cancer, heart disease, asthma, emphysema and chronic obstructive pulmonary disease (COPD). In 1996, a Beckman Research Institute study connected a component of cigarette smoke, *benzopyrene*, to a mutation in a specific gene that can cause uncontrolled cell growth (Bitton, Neuman, & Barnoya, 2005). This study was the first one to show the actual link between smoking and lung cancer. Available statistics show that cigarette smoking causes 87% of lung cancer deaths (National Cancer Institute, 2009). The Centers for Disease Control and Prevention (CDC) has named cigarette smoking as the most preventable factor in morbidity and premature mortality in the United States (Centers for Disease Control and Prevention, 2009).

This abundant scientific evidence notwithstanding, this public health issue is still being debated. Many people justify smoking as a helping with other health problems as it serves to reduce stress and help with weight loss. This ideology is perpetuated by stories of people who say "I know someone who has smoked her whole life and didn't get lung cancer" and represents a failure of public health professionals to disseminate complete and accurate information. Even people who make the connection between smoking and lung cancer may not relate smoking to other adverse health outcomes, resulting in their having only a partial understanding of the associated risks. Even with public health campaigns and cessation efforts, tobacco companies still have a strong influence on the public's perception.

For many years, the tobacco industry propagated the myth that smoking does not cause cancer. In a desperate attempt to keep sales up, tobacco industries tried to refute health research and even hired their own scientists to combat these links. However, this issue is not only relevant to the United States. In Germany, where the smoking rate (36.4% of the adult population ages 15-54 in 2000) exceeds those of many other European counties (World Health Organization, 2003), there is a great industry influence over science (Grüning, Gilmore, & McKee, 2006). Grüning et al (2006) found disturbing results indicating that the tobacco industry's influence over science and scientists in Germany is deeply embedded and has existed at least since the 1950s. This phenomenon poses several threats to the accuracy of findings of research presented by such scientists and whether their research has been biased.

Immunization

Another major concern of public health professionals is the continued resistance to immunization by various sectors of the general public. Vaccinations have reduced the incidence and prevalence of childhood diseases greatly, and more broadly, morbidity and mortality in young children and the elderly. The requirement for most public schools requiring childhood immunizations have led to the reduction of childhood diseases. Many people believe that vaccines should not be used, especially with children, because of a belief that they may cause other health problems (National Institutes of Health, 2006). However, the belief that immunizations will increase the likelihood of disease is repeatedly refuted by scientific evidence.

A recent vaccination controversy surrounds the Gardasil® vaccine to prevent human papillomavirus (HPV), a known cause of cervical cancer. This vaccine has been administered throughout the world and has been proven scientifically to be 100% effective in preventing four HPV strains that account for approximately 70% of cervical cancer with no serious side effects (Vamos, McDermott, & Daley, 2008). However, regardless of the science, common perpetuated ideologies surrounding the HPV vaccine include that the vaccine will cause HPV infection or that it will increase youth's intention to have intercourse. These misinformed beliefs impede efforts of health professionals to reduce the incidence of HPV and cervical cancer. Reverend Thomas J. Euteneuer, president of Human Life International, stated that [tweens] do not fully understand the long term effects of the Gardasil® vaccine and this promotes sex and risky behavior, what is termed "behavioral disinhibition" (Euteneuer, 2006). Public health professionals must work to increase public knowledge about the benefits and risks of such immunizations and dismantle myths and misinformation.

Exceptional concern over components of the measles-mumps-rubella (MMR) vaccine and their relationship to autism also has garnered attention. Autism is a spectrum disorder denoted by the broad range of symptoms associated with it that range from communication deficits (lack of eye contact and verbal communication) to a host of behavioral problems (National Institute of Health, 2006). The idea that the MMR vaccine can lead to autism is based on the fact that symptoms of autism typically develop between three months and three years of age, the same time the vaccine is given to children. The MMR vaccine was specifically singled out because of the preservative *thimerosal* that it contains In 2000, the Institute of Medicine conducted a review of all studies performed on linking the MMR vaccine to autism and concluded that there was no link between vaccines and autism (National Institute of Health, 2006). A further review of the evidence shows that there was no marked increase in the diagnosis of autism after 1988, when the MMR vaccine

became available. To increase awareness on this matter, studies demonstrating that the MMR vaccine is not linked to autism need to be publicized, just as much as the opposing argument is publicized. The public needs to be informed of the research and science to be able to makes appropriate decisions on behalf of their children regarding immunizations.

Although we trust science to be accurate and provide us with "truth," it is important to note that not all science is good science. Ethical, peer-reviewed, replicated studies can provide the public with vital accurate information to ensure health. However, some research is done that does not meet these qualifications and this can lead to serious health problems. There are many examples of this in history such as the Tuskegee Syphilis clinical trials on African American men that now defines unethical research because of the lack of informed consent and withholding of penicillin treatment. Agent Orange herbicide is another example of science failing to meet such criteria. More than 19 million gallons of Agent Orange was used during the Vietnam War to kill unwanted plants and leaves in war zones (Environmental Agents Services, 2003). However, one of the chemical ingredients in Agent Orange was dioxin, which was later found to cause severe health problems including several different types of cancer (Environmental Agents Services, 2003). Thus, it is important to question science and ensure quality of research to produce accurate information. This has become an important role of the public health professional.

Role of the Public Health Professional

The role of public health professionals is to conduct research and programs, disseminate accurate health information, and at times, act as go-betweens for scientists, politicians, and members of the public. There are several ways in which public health professionals fulfill this role. First, they act as researchers and must conduct high quality scientifically-based research that is performed through a regulatory process and designed to advance the health field. This research must be reviewed through accepted scholarly and scientific protocols to ensure quality and integrity. It is also important to develop and implement programs that are evidence-based. This phenomenon refers to programs or practices for which success has been demonstrated through a specific research methodology, and a consistent positive pattern of results that can be generalized to the population (Waters, 2002). Second, public health professionals engage the public in research, programming and promotion. Being culturally-competent and using community-based approaches make the work of public health professionals stronger and allow the public to become empowered and vested in the health problem. Third, public health professionals must disseminate health information strategically. Dissemination and promotion methods are keys to providing accurate, accessible information that reaches the priority population. Traditionally, health information has been distributed to the public through newspapers, op-ed pieces, magazine articles, news reports, television, and radio. However, the Internet has become a common source of health information and education for both health professionals and the public. Today, social networking websites such as MySpace, Facebook, Twitter, and YouTube are growing in popularity for sharing information. Increased communication initiatives have been a strategy to inform the public about scientific facts through such popular outlets (Bubela et al., 2009). As these websites become more common, especially among youth, public health professionals must access them as a forum to speak to the public about scientific research, dismantling myths or unproven theories and providing motivation to practice healthy behaviors.

The process of moving what we learn through research into practice is being examined more in public health. *Knowledge translation* (KT), a term coined in 2000 by Canadian Institutes of Health Research (CIHR), is used in health-care fields to represent this process (Sudsawad, 2007). KT is an interactive process of exchanges between researchers and those who implement research findings in practice (Sudsawad, 2007). This technique can help translate health research findings into medical interventions or public health programming through a variety of different frameworks. For example, the "Understanding-User-Context Framework" identifying the *user group, the issue, the research, the research-user relationship* and *dissemination strategies* (Sudsawad, 2007) can be used in translating research on controversial issues.

Policy

Strong scientific research does not necessarily translate into meaningful public health policies. This gap is a pivotal short-coming of translating public health research into practice. In order to bridge this gap, it is important to understand political dynamics that may enable behavior changes and effect policy change which in turn positively influences public health. Though public policies have to undergo many steps from research to legislative action to effective community adoption and eventual modification, the gap between research and legislation is where public health professionals can take a direct, important role in reducing the translational gap.

Public policy can play a crucial role in behavior change (National Cancer Institute, 2000; National Highway Traffic Safety Administration, 2004; Borland, Chapman, Owen et al., 1990). Science indirectly aids in this process by informing key decision makers and adding legitimacy to a health promotion measure. Scientists and public health experts have relied historically on research alone to effect policy change. Informing others of research findings with potential health benefits has been the cornerstone of lobbying efforts of public health scientists' in the political arena. Reliance on the classic argument that "it is good for public health" has limited effectiveness. This limited result can be due to conflicting research, incongruities

with common knowledge and past experiences, and the inability of scientists to disseminate findings via widely consumed public formats. For example, by the 1950s evidence strongly suggested that smoking was harmful to one's health (Hutchinson, 2004); however, restrictions on public smoking were rare until after 2000 (American Lung Association, 2008). During this forty-year gap, science repeatedly confirmed the negative impact of cigarette smoke; yet, this did not translate into policy change. The argument that research indicates smoking is bad for health was not strong enough to combat other arguments. Tobacco companies presented research that indicated limited or no negative effects from cigarettes (Tobacco, 2009). Additionally, they argued that smoking bans would infringe on the individual freedoms of smokers (R.J. Reynolds Tobacco Company, 2009; Andersen et al., 2006). These arguments were stronger than "health research" for forty years. Perhaps the clearest reason for such arguments holding sway over public opinion is that these arguments are woven into the fabric of contemporary ideology. Science, on the other hand, is unfamiliar territory for most of the lay public. Therefore, public health as a profession must find a toe-hold and begin to balance messages to the public with creative and well-reasoned policy statements and data that have been translated into understandable formats. As opposed to perpetuating the, *us-them: science vs. ideology* conflict, public health professionals can use ideology as a vehicle for moving science into public forums.

Framing Policy

For scientific knowledge to diffuse into effective public policy, it is important for health professionals to expand and transform their political arguments for maximum public support. New approaches to influencing policy should incorporate common aspects of agenda setting and framing. Framing is the portrayal and positioning of an issue. It aids in strategically positioning an issue in the political arena for enhanced success. Public health experts have classically relied on the "public health" frame. However, it is often other frames that resonate more with American voters, such as freedom, independence, equality, economic benefits, and patriotism (Birkland, 2005). For example, the tobacco lobby was successful at portraying the decision to smoke as an individual freedom, and restrictions would limit an individual's right to smoke (Hahn, Toumey, Rayens, & McCoy, 1999). Health professionals also tap into new, culturally relevant frames to advance health promotion agendas. For instance, rather than simply arguing that smoking is bad for health, the argument that second hand smoke infringed on the right to clean air for non-smokers gained much support (Americans for Nonsmokers Rights, 2009).

Reframing is also important for minimizing the level of controversy. Controversial policies are less likely to be introduced into committees and even less likely to be on the final agenda (Birkland, 2005). It is under these circumstances where the struggle between science and ideology is most apparent. However, public health officials can rally untapped, wider support by reframing issues. For instance, introducing more comprehensive family planning support can be reframed as a fight against abortion or reducing costs for taxpayers by reducing unwanted pregnancies. By reframing the issue, broader support can be reached, which is essential for agenda setting.

Instead of butting against common ideologies, it is important to use these frames consistent with cultural ideologies as a vehicle for the advancement of public health agendas. Highlighting the economic advantages of a health-related policy or the resulting equality it could bring about should go hand-in-hand with research that indicates it would be a positive change for public health.

Conclusions

The science versus ideology conflict has been at the crux of environmental and public health issues for centuries. Such opposing points of view structure how populations and communities, both local and global, interact with one another and with the world around them. Historically, both have had ardent proponents and the more controversial an issue is the more it seems we fervently hold to our arguments. In doing so, we risk becoming entrenched in those points of view. It is possible, however to set aside the posture of opposition and seek out avenues for integration. Ideology can, in fact become a platform for introducing scientific knowledge to the lay public in much the same way that science can be a vehicle for cultural ideals.

Public health professionals can employ several strategies to minimize this gap and incorporate common ideologies into public health efforts. It is in the public health arena that we find opportunities to acknowledge legitimacy of ideologies through culturally competent and community-based research. Ideology can be transformed through effective dissemination of research findings, and blending commonly held beliefs into the framing of public policy, thereby increasing the likelihood that health policy succeeds and population behavior changes. Rather than positing the argument of *science vs. ideology*, it is important to understand the role of ideology and its inherent influence on public perception and misperception. By adopting strategies for integration of ideology and science we find a forum for introducing helpful research to the lay public and making scientific truth more palatable and accessible. The objective is not science eliminating ideology, but rather science informing ideology as the next best step toward public health and wellness.

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